IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Mercure, et al.

Serial No.: 10/036,708

Filed: December 21, 2001

Art Unit: 1771

Examiner: Ula C. Ruddock

Title: REINFORCED SHRINK WRAP AND METHOD OF MANUFACTURE

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

CERTIFICATE OF MAILING BY EXPRESS MAIL

"EXPRESS MAIL" Mailing Label No. EK287112175US
Date of Deposit: 09/23/03
I hereby certify that this paper, including the documents referred to therein, or fee is being deposited with the U.S. Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Type or Print Name: Tiffany Patterson
Signature:

APPEAL BRIEF PURSUANT TO 37 C.F.R. §§1.191 AND 1.192

Appellants take this appeal from the April 24, 2003, Final Office Action in the above-identified application. A Notice of Appeal was filed on July 23, 2003. Appellants file this Appeal Brief in triplicate in connection with the Notice of Appeal.

1. REAL PARTY IN INTEREST

The real party in interest is Reef Industries, Inc., having a place of business at 10020 Mykawa, Houston, Texas 77048.

2. RELATED APPEALS AND INTERFERENCES

Appellants know of no other appeal or interference that will directly affect, or be directly affected by, or that will have a bearing on the Board's decision in the pending appeal.

3. STATUS OF CLAIMS

Claims 1-4, 6-18, 20-24 and 27-29 are pending in this application and are the claims from which this appeal is taken. These claims were finally rejected in an Office Action dated April 24, 2003 ("Final Office Action"). Claims 5, 19, 25-26, and 30 were previously cancelled. A copy of the pending claims is attached as Appendix A.

STATUS CHECK - Examiner Answers?
Due 3-23-04
By JCB On 9-24-03

4. STATUS OF AMENDMENTS

All amendments have been entered and there are no amendments pending.

5. SUMMARY OF THE INVENTION

One aspect of the invention relates to a reinforced shrink wrap (sometimes referred to as "shrink wrap") made by an extrusion-lamination process. Application, p. 5, ll. 2-3. The reinforced shrink wrap includes: (1) a first layer of thermoplastic; (2) a second layer of thermoplastic, at least one layer of the first and the second layers includes a shrink film of highly-irradiated polyolefin; (3) a reinforcing grid disposed between the first and the second layers of thermoplastic; and (4) a tie layer of elastomeric material disposed between the first layer and the second layer holding the reinforcing grid, but allowing slippage of the reinforcing grid in the tie layer upon tensile loading. Application, p. 6, ll. 8-15. The first layer, the second layer, the reinforcing grid, and the tie layer are laminated together to form the reinforced shrink wrap. *Id.* The tie layer preferably is a material with a lower modulus than the outer sheets. Application, p. 8, ll. 12-13.

6. ISSUES

I. Whether Appellants' invention as claimed is anticipated under 35 U.S.C. § 102(b) by U.S. Patent 5,328,743 (*Wynne*).

II. Whether Appellants' invention as claimed is obvious under 35 U.S.C. § 103(a) over *Wynne*.

7. GROUPING OF CLAIMS

For purpose of this appeal, independent Claims 1, 14, 15 and 27 and dependent Claims 2-4, 6-13, 16-24 and 28-29 shall be considered together.

8. ARGUMENTS

A. Introduction

Each of Appellants' claims pending on appeal includes, among other things, an extrusion-laminated reinforced shrink wrap comprising (1) a first layer of thermoplastic; (2) a second layer of thermoplastic; (3) a reinforcing grid disposed between the first and the second layers of thermoplastic; and (4) a tie layer of elastomeric material disposed between the first layer and the

second layer holding the reinforcing grid. Appellants submit that the claims are patentable because the prior art of record fails to teach, suggest, or otherwise disclose Appellants' multi-layer extrusion-laminated reinforced shrink wrap, and specifically the tie layer of elastomeric material used therein. The tie layer improves the lamination strength of the extrusion-laminated reinforced shrink wrap, a result that is both unexpected and advantageous. Thus, Appellants submit that the claims are patentable over the prior art of record.

B. Rejections Under 35 U.S.C. §102(b)

The Examiner finally rejected Claims 1-4, 6-18, 20-24, and 27-29 under 35 U.S.C. § 102(b), as being anticipated by *Wynne*. Independent claim 1 reads as follows:

> 1. An extrusion-laminated reinforced shrink wrap comprising:
> a first layer of thermoplastic;
> a second layer of thermoplastic;
> at least one layer of said first and second layers comprising a shrink film of highly irradiated polyolefin;
> a reinforcing grid disposed between the first and second layers of thermoplastic; and
> a tie layer of elastomeric material disposed between the first layer and the second layer holding the reinforcing grid but allowing slippage of the reinforcing grid in the tie layer upon tensile loading,
> wherein the first layer, the second layer, the reinforcing grid and the tie layer are extrusion laminated together to form the reinforced shrink wrap, and wherein the elastomeric tie layer has a lower modulus than at least one of the thermoplastic layers.

Independent Claims 14, 15, and 27 recite similar limitations. Appellants respectfully disagree that *Wynne* anticipates the claims for the reasons set forth below.

1. *Wynne* does not disclose a tie layer.

A long standing principle under U.S. patent law is that "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). This means that "[t]he identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Appellants respectfully submit that neither *Wynne* nor any other art of record, taken alone or in combination, discloses or suggests each and every element recited in the independent claims. Specifically, nowhere does *Wynne* disclose or suggest the claimed tie layer. Rather,

Wynne discloses an adhesive layer. An adhesive layer is altogether different from a tie layer due to the differences in the lamination process used for the two layers. Three lamination technologies are commonly used and known in the art: adhesive lamination, thermal (or heat) lamination, and extrusion lamination. Adhesive lamination uses an **adhesive layer** applied onto one of the substrates prior to combination of the thermoplastic layers. Thermal (or heat) lamination melts the **adhesive layer**, either by heated rollers or a heated oven prior to combination. Extrusion lamination, on the other hand, uses a molten polymer web that serves as a **tie layer**. The tie layer would not work (at least not very well) in an adhesion lamination process, and the adhesive layer likewise would not work in an extrusion lamination process. Therefore, disclosure of an adhesive layer cannot constitute disclosure of the claimed tie layer.

2. A tie layer is functionally different from an adhesive layer.

Furthermore, a tie layer functions differently in a shrink wrap than an adhesive layer. In an adhesive layer, the amount of adhesive can be controlled so that it does not retard movement of the reinforcing grid. The adhesive layer, however, does not allow slippage of the grid while simultaneously maintaining lamination. Rather, as is known in the art, the adhesive layer must delaminate in order to allow movement of the grid. This aspect of the adhesive layer is noted by *Wynne*: "[t]he grid should sag to prevent further tearing." Col. 2, ll. 39-40. The "sagging" effect refers to the delamination of the adhesive from the grid.

A tie layer, on the other hand, maintains lamination while simultaneously allowing slippage to occur. The tie layer does not need to delaminate in order to allow movement of the grid. Therefore, the two layers are clearly different functionally. For this reason, Appellants again respectfully submit that disclosure of the adhesive layer does not constitute disclosure of the tie layer.

3. The tie layer and the adhesive layer result in different properties.

The difference between the tie layer and the adhesive layer is also reflected in the difference in the physical properties and characteristics of the resulting shrink wrap. Specifically, the two layers result in shrink wraps with dramatically different lamination strengths. Table 1 below illustrates this difference in terms of the 3" Load @ Yield for each type of shrink wrap. Note the significant increase to the 3" Load @ Yield for a 5-ply shrink wrap using a tie layer and a 5-ply shrink wrap using an adhesive layer. A shrink wrap made in

accordance with the claimed invention has a 3" Load @ Yield that is almost twice that of a shrink wrap made using an adhesive layer such as disclosed in *Wynne*.

Table 1

Property	ASTM	Tie Layer	Adhesive Layer
Thickness	D-2103	8.3 mils	6.4 mils
3" Load @ Yield -- MD	D-882	165.0 lbf	89.5 lbf
3" Load @ Yield – TD	D-882	165.0 lbf	85.9 lbf

Due to the difference in the resulting lamination strength, disclosure of an adhesive layer in a shrink wrap by *Wynne*, again, is not the same as a disclosure of a tie layer in a shrink wrap.

4. *Wynne* does not disclose using extrusion-lamination.

Wynne not only fails to disclose the claimed tie layer, but also fails to disclose **the use of extrusion-lamination in making a shrink wrap**. The Examiner has conceded this fact, but urges that the difference in the two processes cannot be the basis of patentability unless there is a showing of unexpected results. Final Office Action, paragraph bridging pp. 3-4. The claimed invention is a **different product with** unexpected results. As demonstrated in Table 1, a shrink wrap made in accordance with the claimed invention has far greater lamination strength than a shrink wrap made in accordance with *Wynne*. The claimed extrusion-lamination process is key to achieving these unexpectedly superior results. Nowhere does *Wynne* disclose or suggest that its process results in **any** improvement in lamination strength, much less the almost doubled increases that may be achieved with the claimed invention. Because the claimed shrink wrap has greater lamination strength than the ones disclosed in *Wynne*, the Appellant has demonstrated that the claimed shrink wrap is a different product than those disclosed in *Wynne*. Therefore, the claimed invention is novel.

Consequently, for at least the reasons stated above, *Wynne* cannot be considered to anticipate the claimed invention. Therefore, Appellants respectfully request that the rejection of the claims under 35 U.S.C. §102(b) be reversed.

C. Rejections Under 35 U.S.C. §103(a)

The Examiner also finally rejected Claims 1-4, 6-18, 20-24, and 27-29 under 35 U.S.C. § 103(a), as being obvious over *Wynne*. Appellants respectfully disagree that *Wynne* renders the claims obvious for the reasons set forth below.

1. **A Subgenus is not Rendered Obvious by a Generic Teaching Unless the Prior Art Suggests the Desirability of the Subgenus**

The fact that a claimed species or subgenus is encompassed by a prior art genus is not sufficient by itself to establish a *prima facie* case of obviousness. *In re Baird,* 29 USPQ2d 1550, 1552 (Fed. Cir. 1994); *In re Jones*, 21 USPQ2d 1941, 1943 (Fed. Cir. 1992); *In re Deuel*, 34 USPQ2d 1210, 1215 (Fed. Cir. 1995). To establish a *prima facie* case of obviousness in a genus-species chemical composition situation, as in any other §103(a) case, it is essential that there be some motivation or suggestion to make the claimed invention in light of the prior art teachings. *In re Brouwer,* 37 USPQ2d 1663, 1666 (Fed. Cir. 1996). The claims are not obvious "unless the prior art suggested the desirability of [such a] modification." *In re Gordon,* 221 USPQ 1125, 1127 (Fed. Cir. 1984).

In the present case, an adhesive layer is a genus for which a tie layer is a species. Appellants respectfully submit, however, that there is no simply motivation to make a reinforced shrink wrap with a tie layer in light of the prior art teachings. *Wynne* merely discloses the use of an adhesive layer in a reinforced shrink wrap. Nothing in *Wynne* even hints at the desirability of using a tie layer in a reinforced shrink wrap. Accordingly, because there is no motivation in *Wynne* to use a tie layer to make a shrink wrap, Appellants respectfully submit that the claims are not obvious.

2. **Unexpected and Advantageous Properties Can Rebut a Finding of Obviousness**

Evidence for rebutting a finding of obviousness may relate to any of the factors for determining obviousness, including secondary considerations. *Graham v. John Deere Co.,* 383 U.S. 1, 17, 148 USPQ 459, 467 (1966); *In re Piasecki*, 223 USPQ 785, 788 (Fed. Cir. 1984). Such rebuttal evidence may include evidence that the claimed invention yields **unexpectedly improved properties** or properties not present in the prior art, or may consist of a showing that

the claimed compound possesses unexpected properties. *In re Dillon*, 16 USPQ2d 1897, 1901 (Fed. Cir. 1991) (emphasis added). Moreover, "[e]vidence that a compound is unexpectedly superior in one of a spectrum of common properties . . . can be enough to rebut a *prima facie* case of obviousness." *In re Chupp*, 2 USPQ2d 1437, 1439 (Fed. Cir. 1987).

In the present case, the claimed invention results in unexpectedly improved properties or properties that are not present in the prior art. Specifically, the tie layer of the claimed invention results in unexpectedly high lamination strength values. As shown in Table 1, the 3" Load @ Yield of a shrink wrap made with a tie layer is almost twice that of a shrink wrap made with an adhesive layer. In addition, according to the Declaration of Mr. Dennis J. Olheiser (attached as Appendix B), the average peel strength of 5-ply shrink wraps with adhesive layers is only about 25 oz., whereas the average peel strength of 5-ply shrink wraps with tie layers is about 70 oz., a result that is almost three times higher. Nowhere does *Wynne* provide any teaching regarding improved lamination strength values, much less the unexpectedly high lamination strength values that result from the claimed invention.

Appellants respectfully submit that the above showings of unexpected and advantageous properties rebut any *prima facie* case of obviousness that *Wynne* may establish and further support the non-obviousness of the invention.

3. Proceeding contrary to conventional wisdom is evidence of nonobviousness.

It is well established that proceeding contrary to accepted wisdom in the art is evidence of nonobviousness. In re *Hedges*, 228 USPQ 685 (Fed. Cir. 1986). Furthermore, "[k]nown disadvantages in old devices which would naturally discourage search for new inventions may be taken into account in determining obviousness." *United States v. Adams*, 383 U.S. 39, 52, 148 USPQ 479, 484 (1966).

In the present case, Appellants' use of an extrusion-lamination process to make a shrink wrap goes against conventional wisdom. Before Appellants' claimed invention, there existed a belief in the art that a shrink wrap could not be laminated with other layers in an extrusion-lamination process. This was due to concerns that the processing conditions in a typical extrusion-lamination process may cause the shrink wrap to shrink during the process. Appellants found, however, that shrink wraps can be laminated with other layers in an extrusion-lamination process under certain conditions. Moreover, the use of such a lamination process actually

produces a shrink wrap with greatly improved tensile properties, as demonstrated in Table 1 and in the Declaration of Mr. Dennis J. Olheiser.

Accordingly, because there is no motivation in *Wynne* to use a tie layer to make a reinforced shrink wrap, and because doing so actually goes against conventional wisdom at the time the application was filed, Appellants respectfully submit that the claims are not obvious. Accordingly, Appellants request that the rejection of the claims under 35 U.S.C. §103(a) based on *Wynne* be reversed.

9. CONCLUSION.

For the reasons set forth above, the appealed Claims 1-4, 6-18, 20-24, and 27-29 are neither anticipated under 35 U.S.C. §102 nor rendered obvious under 35 U.S.C. § 103(a) by *Wynne*. Accordingly, the final rejection of these claims should be reversed.

The fee of $320 required by 37 C.F.R. § 1.17(c) is enclosed herewith. The Commissioner is hereby authorized to charge Deposit Account No. 10-0447, reference 41836.55USC1(BAI) for any additional fees inadvertently omitted which may be necessary now or during the pendency of this application, except for the issue fee.

In accordance with 37 C.F.R. § 1.192(a), this brief is submitted in triplicate.

Respectfully submitted,

JENKENS & GILCHRIST,
A Professional Corporation

Daniel Nguyen, Reg. No. 42,933

for J. Benjamin Bai
Reg. No.: 43,481

Date: 9/23/03

Jenkens & Gilchrist,
A Professional Corporation
1401 McKinney, Suite 2700
Houston, Texas 77010
(713) 951-3387
(713) 951-3314 (fax)

APPENDIX A: CLEAN COPY OF CURRENT PENDING CLAIMS

1. An extrusion-laminated reinforced shrink wrap comprising:

a first layer of thermoplastic;

a second layer of thermoplastic;

at least one layer of said first and second layers comprising a shrink film of highly irradiated polyolefin;

a reinforcing grid disposed between the first and second layers of thermoplastic; and

a tie layer of elastomeric material disposed between the first layer and the second layer holding the reinforcing grid but allowing slippage of the reinforcing grid in the tie layer upon tensile loading,

wherein the first layer, the second layer, the reinforcing grid and the tie layer are extrusion laminated together to form the reinforced shrink wrap, and wherein the elastomeric tie layer has a lower modulus than at least one of the thermoplastic layers.

2. The extrusion-laminated reinforced shrink wrap of claim 1 wherein the shrink film of highly irradiated polyolefin is polyethylene.

3. The extrusion-laminated reinforced shrink wrap of claim 1 wherein the reinforcing grid is a non-woven scrim.

4. The extrusion-laminated reinforced shrink wrap of claim 3 wherein the reinforcing grid material is selected from the group consisting of nylon filament and polyester filament from about 200 to about 800 denier.

6. The extrusion-laminated reinforced shrink wrap of claim 1 wherein at least one of said thermoplastic layers includes multiple plies of thermoplastic.

7. The extrusion-laminated reinforced shrink wrap of claim 1 wherein the tie layer is from about 0.75 to about 1.5 mils in thickness.

8. The extrusion-laminated reinforced shrink wrap of claim 1 wherein the first and second layers of thermoplastic are from about 0.75 to about 6 mils thick.

9. The extrusion-laminated reinforced shrink wrap of claim 1 wherein at least one of the thermoplastic layers includes an additive selected from the group consisting of ultraviolet stabilizer, flame retardant, static inhibitor, color additive, antioxidant, corrosion inhibitor, biocide and mixtures thereof.

10. The extrusion-laminated reinforced shrink wrap of claim 1 wherein the tie layer includes an additive selected from the group consisting of ultraviolet stabilizer, flame retardant, static inhibitor, color additive, antioxidant, corrosion inhibitor, biocide and mixtures thereof.

11. The extrusion-laminated reinforced shrink wrap of claim 6 wherein at least one ply of thermoplastic contains an additive selected from the group consisting of ultraviolet stabilizer, flame retardant, static inhibitor, color additive, antioxidant, corrosion inhibitor, biocide and mixtures thereof.

12. The extrusion-laminated reinforced shrink wrap of claim 2 wherein the polyethylene is selected from the group consisting of linear low density polyethylene, low density polyethylene and mixtures thereof.

13. A product cover made of the extrusion-laminated reinforced shrink wrap of claim 1.

14. An extrusion-laminated reinforced shrink wrap comprising:

a layer of shrink film of highly irradiated polyethylene selected from the group consisting of linear low density polyethylene, low density polyethylene and mixtures thereof between about 0.75 and about 1.5 mils in thickness;

a layer of thermoplastic;

an elastomeric tie layer extrusion laminated between the layer of thermoplastic and the layer of shrink film;

a yarn selected from the group consisting of nylon and polyester in a crisscross grid pattern disposed in the elastomeric tie layer, the tie layer of holding yarn but allowing slippage of the yarn in the tie layer upon tensile loading and wherein the elastomeric tie layer has a lower modulus than the thermoplastic layer.

15. A multi-layered extrusion-laminated reinforced shrink wrap comprising:

at least three layers of thermoplastic;

at least one of the thermoplastic layers is a shrink film of highly irradiated polyolefin; and

at least two tie layers of elastomeric material alternatively disposed between the thermoplastic layers, each holding a reinforcing grid but allowing slippage of the reinforcing grid in the tie layer upon tensile loading,

wherein the layers of thermoplastic, the tie layers with the grid are extrusion laminated together to form the multi-layered reinforced shrink wrap, and

wherein the elastomeric tie layers have a lower modulus than at least one of

the thermoplastic layers.

16. The multi-layered extrusion-laminated reinforced shrink wrap of claim 15 wherein the shrink film of highly irradiated polyolefin is polyethylene.

17. The multi-layered extrusion-laminated reinforced shrink wrap of claim 15 wherein the reinforcing grid is a non-woven scrim.

18. The multi-layered extrusion-laminated reinforced shrink wrap of claim 15 wherein the reinforcing grid is selected from the group consisting of nylon filament and polyester filament from about 200 to about 800 denier.

20. The multi-layered extrusion-laminated reinforced shrink wrap of claim 15 wherein at least one of said thermoplastic layers includes multiple thermoplastic plies.

21. The multi-layered extrusion-laminated reinforced shrink wrap of claim 15 wherein each of the tie layers is from about 0.75 to about 1.5 mils in thickness.

22. The multi-layered extrusion-laminated reinforced shrink wrap of claim 15 wherein the thermoplastic layers are from about 0.75 to about 6 mils thick.

23. The multi-layered extrusion-laminated reinforced shrink wrap of claim 15 wherein at least one of the thermoplastic layers contains an additive selected from the group consisting of ultraviolet stabilizer, flame retardant, static inhibitor, color additive, antioxidant, corrosion inhibitor, biocide and mixtures thereof.

24. A product cover made of the multi-layered extrusion-laminated reinforced shrink wrap of claim 15.

27. An extrusion-laminated reinforced shrink wrap obtained by the method comprising:

providing two thermoplastic sheets, at least one of the sheets being a shrink film;

placing a reinforcing grid between the two thermoplastic sheets;

extruding an elastomeric material at an elevated temperature to form a tie layer between the two sheets, the tie layer being in contact with the reinforcing grid and the two thermoplastic sheets;

extrusion laminating the two sheets and the reinforcing grid with the tie layer to form a reinforced shrink wrap; and

controlling the thickness of the tie layer so that the shrink film does not begin to shrink substantially during laminating,

wherein the reinforcing grid is held by the elastomeric tie layer between the two thermoplastic sheets after laminating, and

wherein the elastomeric layer has a lower modulus than at least one of the thermoplastic layers.

28. The extrusion-laminated reinforced shrink wrap of claim 27 wherein the shrink film is highly irradiated polyethylene.

29. The extrusion-laminated reinforced shrink wrap of claim 27 wherein the reinforcing grid is a non-woven scrim.

APPENDIX B: DECLARATION OF MR. DENNIS J. OLHEISER

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Mercure et al.	§	
Serial No.: 09/263,186	§	Group No.: 1771
Filed: March 5, 1999	§	Examiner: U. Ruddock
For: Reinforced Shrink Wrap and Method of Manufacture	§	

Box CPA
Assistant Commissioner for Patents
Washington, DC 20231

Dear Sir:

CERTIFICATE OF MAILING 37 CFR 1.10

EXPRESS MAIL Mailing Label No.: EK287120755US
Date of Deposit: 3/27/01

I hereby certify that this paper, including the documents referred to therein, or fee is being deposited with the U.S. Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Box CPA, Washington, DC 20231.

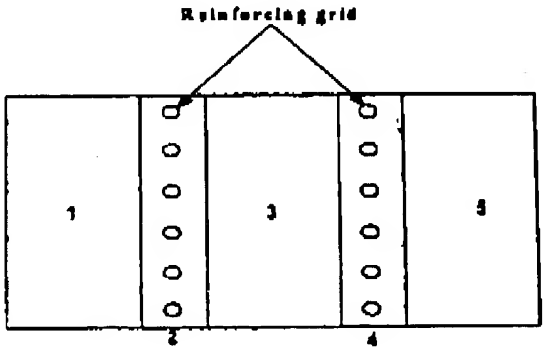
Type or Print Name: Kim Kennedy

Signature

DECLARATION OF MR. DENNIS J. OLHEISER UNDER 37 C.F.R. § 1.132

I, Dennis J. Olheiser, am an inventor of the above-referenced patent application. I have measured or caused the measurement of the peel strength of various 5-ply shrink laminates. The average peel strength of 5-ply shrink laminates with tie layers is about 70 oz., whereas the average peel strength of 5-ply shrink laminates with adhesive layers is about 25 oz.

The 5-ply shrink laminates have a cross-sectional structure illustrated in the following. The exemplified structure is one possible construction of a shrink laminate and should not be construed to limited the invention as otherwise described in the patent application.



All shrink laminates have a thickness in the range of about 4 mils to about 14 mils. A typical 5 ply construction, as illustrated above, comprises an outer thermoplastic film layer (1), a tie layer or adhesive layer (2) with a reinforcing grid, a highly irradiated polyolefin shrink film (3), a tie layer or adhesive layer (4) with a reinforcing grid, and an inner thermoplastic film layer (5).

Layers 2 and 4 are either adhesive layers or tie layers. The adhesive layers are made from a water based acrylic pressure sensitive adhesive, whereas the tie layers are made from low modulus polyolefin resins. Typically, the adhesive layers or tie layers have a thickness of about 0.5 to 1.5 mils thick. The shrink laminates with adhesive layers were made in accordance with the method disclosed in U.S. Patent No. 5,328,743. The shrink laminates with tie layers were made in accordance with the processes described in the above-referenced patent application.

The peel strength of each shrink laminate was obtained in accordance with ASTM D-1876, which is the standard test method for peel resistance of adhesives (T-peel test). A copy of the ASTM D-1876 testing procedures is attached herewith as Appendix A. Generally, the test is conducted by taking one inch wide by twelve inch long samples of a laminated product. A small section of the laminate is separated by hand to allow sufficient material to be secured in the grips of a tensile testing machine. One edge of the separated section is secured in the upper grips and the remaining section of the laminate is secured in the lower grips. The bottom grip is fixed, and the upper grip is moved at a rate of 10 inches per minute.

About 15 shrink laminates with **adhesive layers** produced over a two month period were tested and the average peel strength of the 5-ply shrink laminates with adhesive layers was about 25 oz. On the other hand, about 30 shrink laminates with tie layers produced over a two month period were tested, the average peel strength of the 5-ply shrink laminates was about 70 oz. **The data show that a tie layer has a higher lamination strength than an adhesive layer in a multi-layered shrink laminate.**

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by

fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of any application for which it is used.

3/26/2001
Date

Dennis J. Olhoffer

Designation: D 1876 – 95

Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)[1]

This standard is issued under the fixed designation D 1876; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense as part of Federal Test Method Standard No. 175a. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

INTRODUCTION

The accuracy of the results of strength tests of adhesive bonds will depend on the conditions under which the bonding process is carried out. Unless otherwise agreed upon by the manufacturer and the purchaser, the bonding conditions shall be prescribed by the manufacturer of the adhesive. In order to ensure that complete information is available to the individual conducting the tests, the manufacturer of the adhesive shall furnish numerical values and other specific information for each of the following variables:

(*1*) Procedure for preparation of the surfaces prior to application of the adhesive, the cleaning and drying of metal surfaces, and special surface treatments such as sanding, which are not specifically limited by the pertinent test method.

(*2*) Complete mixing directions for the adhesive.

(*3*) Conditions for application of the adhesive, including the rate of spread or thickness of film, number of coats to be applied, whether to be applied to one or both surfaces, and the conditions of drying where more than one coat is required.

(*4*) Assembly conditions before application of pressure, including the room temperature, length of time, and whether open or closed assembly is to be used.

(*5*) Curing conditions, including the amount of pressure to be applied, the length of time under pressure, and the temperature of the assembly when under pressure. It should be stated whether this temperature is that of the glue line, or of the atmosphere at which the assembly is to be maintained.

(*6*) Conditioning procedure before testing, unless a standard procedure is specified, including the length of time, temperature, and relative humidity.

A range may be prescribed for any variable by the manufacturer of the adhesive, if it can be assumed by the test operator that any arbitrarily chosen value within such a range or any combination of such values for several variables will be acceptable to both the manufacturer and the purchaser of the adhesive.

1. Scope

1.1 This test method is primarily intended for determining the relative peel resistance of adhesive bonds between flexible adherends by means of a T-type specimen.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for information purposes only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

B 209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate[2]

D 907 Terminology of Adhesives[2]

3. Terminology

3.1 *Definitions*—Many terms in this test method are defined in Terminology D 907.

3.1.1 *peel strength, n*—the average load per unit width of bondline required to separate progressively a flexible member from a rigid member or another flexible member.

Discussion—Flexible has different meanings in different peel tests, such as "T", 180-degree, floating-roller, or climbing-drum. The angle between the members varies with the type of peel test.

3.2 *Descriptions of Terms Specific to This Standard:*

3.2.1 *flexible, adj*—indicates that the adherends shall have

[1] This test method is under the jurisdiction of ASTM Committee D-14 on Adhesives and is the direct responsibility of D14.80 on Metal Bonding Adhesives.
Current edition approved Sept. 10, 1995. Published November 1995. Originally published as D 1876 – 61 T. Last previous edition D 1876 – 93.

[2] *Annual Book of ASTM Standards*, Vol 02.01.

[3] *Annual Book of ASTM Standards*, Vol 15.06.

7.3 Determine the peel resistance over at least a 127-mm (5-in.) length of the bond line after the initial peak.

8. Calculation

8.1 Determine from the autographic curve for the first 127 mm (5 in.) of peeling after the initial peak the average peeling load in pounds per inch of the specimen width required to separate the adherends. It is preferred that the average to be determined from the curve with the use of a planimeter.

NOTE 10—In case a planimeter is not used, the average may be calculated as the average of load readings taken at fixed increments of crosshead motion. For example, the load may be recorded at each 25-mm (1-in.) interval of head motion (or each 12.7-mm (0.5-in.) interval of bond separation) following the initial peak, until at least ten readings have been obtained.

9. Report

9.1 Report the following information:

9.1.1 Complete identification of the adhesive tested, including type, source, manufacturer's code number, batch or lot number, form, etc.,

9.1.2 Complete identification of adherends used, including material, thickness, surface preparation, and orientation,

9.1.3 Description of bonding process, including method of application of adhesive, glue-line thickness, drying or precuring conditions (where applicable), curing time, temperature, and pressure,

9.1.4 Average thickness of adhesive layer after formation of the joint, within 0.025 mm (0.001 in.). The method of obtaining the thickness of the adhesive layer shall be described including procedure, location of measurement, and range of measurements,

9.1.5 Complete description of the test specimens, including dimensions and construction of the test specimens, conditions used for cutting individual test specimens, number of test panels represented, and number of individual test specimens,

9.1.6 Conditioning procedure prior to testing,

9.1.7 Type of test machine and crosshead separation rate used,

9.1.8 Method of recording load and determining average load,

9.1.9 Average, maximum, and minimum peeling load values for each individual specimen,

9.1.10 Average T-peel strength in pounds per inch of width for each combination of materials and constructions under test, and

9.1.11 Type of failure, that is, cohesive failure within the adhesive or adherend or adhesion to the adherend, or combination thereof, for each individual specimen.

10. Precision and Bias

10.1 A precision and bias statement does not exist for this test method because resources necessary for round-robin testing have not been forthcoming.

11. Keywords

11.1 adhesive bonding; flexible adherends; T-peel strength